WQB "Wide Aperture Quad" for Main Injector

1 April 2004
IB2 conference room
9:00 AM

Attendees: Leon Bartelson, Bruce Brown, John Carson, Weiren Chou, TJ Gardner, Dave Harding, Vladimir Kashikhin, Ioanis Kourbanis, François Ostiguy, John Zweibohmer

There has been little progress on the conceptual design. The lamination is the first big issue, and confusion about the steel properties has stalled progress.

Vladimir is concerned that the steel samples we received may not be typical of a production run. He is interested in the chemical composition and whether or not the steel is oriented, as well as how the sample strips were prepared. Gregg Kobliska will be trying to resolve those issues. This steel has much better high field properties than the Main Injector steel, but a higher remanent field. Vladimir has found some Russian-made steel with similar properties that gives these measurements more credibility. The plan is to develop a performance specification and ask three steel makers for quotes. We discussed the effect of adding silicon and whether or not that was a good idea. With the large aperture of these magnets, we can tolerate a higher remanent field than on some other magnets. Lamination shuffling is possible if necessary to homogenize the steel properties, but not attractive. Depending on the delivery schedules, it might be possible to make a fine tuning of the lamination die after learning the steel properties.

So far the 4Q120 conductor in stock looks attractive. We can defer the obligation until FY05 while eliminating one schedule risk. The price is $2.80 per pound, compared to $2.60 per pound for newly purchased conductor. One splice will be required in each coil, but we can do these very reliably. A test is under way to see how tight a radius we can hold n bending the copper without distorting the cooling water hole. A calculation is required to assure that there is adequate cooling. For thermal calculations we will use the 2000 A RMS quoted in the FMI Technical Design Handbook.

The 4Q120 beam tubes are adequate as is, reducing another expense. We will try to deform them slightly to increase the horizontal aperture. There is a weld seam in one lobe. We will put that up or down, rather than to one side. We will check and see what the permeability of the seams is. The material is 304L. There will be a step in the beam tube wall going from the "star" shape to the Lambertsons and back. Main Injector needs to specify how to make that transition. Currently there is nothing special in either magnet, but there is a spool between the two. Installing the WQB magnets will give an opportunity to reduce the impedance by adding to the rest of the Lambertsons the same lamination edge shields that are in the NuMI and Tevatron Lambertsons. That gain should not be squandered with a careless transition. Large aperture BPM's are needed at these locations. They exist at the main points, but the Recycler connections have standard BPM's.

Lucy reports that the magnet will fit in each of the proposed locations.

Next meeting in two weeks: Thursday, 15 April 2004. Same time, same place. We plan to have enough information to launch the steel procurement. If not, we will postpone the meeting.